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(54) **Shutters with tiltable louver boards.**

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**EP-A- 0 119 369**  
**EP-A- 0 220 355**  
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**US-A- 2 607 585**  
**US-A- 2 610 371**

(73) Proprietor : **MAZZOCCO, Antonio**  
**Via Vaccaro 1**  
**I-67031 Castel Di Sangro (IT)**

(72) Inventor : **MAZZOCCO, Antonio**  
**Via Vaccaro 1**  
**I-67031 Castel Di Sangro (IT)**

(74) Representative : **Sarpi, Maurizio**  
**Studio FERRARIO Via Collina, 36**  
**I-00187 Roma (IT)**

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## Description

The object of the present invention is an improvement of the tiltable louver-board shutters.

During the past half-century, the conventional shutters with fixed louver-boards, downwards inclined and mainly made of wood, have been replaced firstly by windable roller-blinds which while not being the best solution in the matter of window blinds for buildings, have been very popular due to their seeming cheapness and to their practicalness disappearing when opened.

At relatively recent times, due to reasons depending on the energy crisis and for structural functional and aesthetic considerations the classic shutter has been preferred again that is a shutter with louver boards made of various materials such as wood, metal and plastic materials and disposed horizontally in parallel rows either fixed or tiltable.

In the recent years the request for tiltable louver boards has remarkably increased and at the same time, the designers and builders have directed their attention to a shutter provided with tiltable louver boards in which the control of the boards tilt is embodied into the periphery frame of the shutter.

Various attempts have been implemented and proposed for solving this problem. For instance the USA Patent Number 2.610.371 granted in date 16-9-1952 to Daniel I. Hite provides a tilting device of the louver boards which uses a pair of parallel racks vertically disposed which engage a series of pinions connected with the boards. A crank control located outside of the window frame causes the respective sliding of said racks and consequently the tilting of the boards about their longitudinal axes. The racks comprise sturdy and solid rods, of which the lengths are cut to fit the particular size of the window whereby the control device is rather obstructive and complicated and has an obliged position. Other solutions have been also proposed which however imply mechanical complications, scarcely reliable operation, remarkable obstruction and substantially suffer from the following limitations.

I. - Lack of good sealing capacity against light and rain and wind both horizontally, and vertically.

II. - Unstable louver boards and lack of self-locking of the said boards.

III. - The tilting of the board is not ample enough, the rotation thereof being at the maximum 90 deg.

IV. - Automatic control systems for tilting the boards cannot be applied.

V. - The manufacture of a modular production readily adaptable to satisfy the customer dimensional requirements, with particular reference the shutter height and the location of one or more control spots of the louver movement cannot be made.

From EP-A-0 119 369 is known a shutter with tiltable louver boards comprising in combination a support frame comprising standard sections and made of two horizontal cross members and two upright side struts and a modular assembly for supporting and rotating said louver boards into said side struts. Such modular assembly provides a series of rack devices which can be operated by a knob to be inserted in a threaded hole of a rack bar, so as to rotate a cog-wheel sector which forces a slat jointed to it through a conical pins, to rotate around its own axis. This device solves of course modularity problems, but not those of the reduced rotation of the louver boards nor the self-locking of the same in their positions either.

The purpose of this invention is to realize a tiltable louver board which prevents the above drawbacks and exhibits modular shape and size requirements, components standardization, ready mounting with no use of any tool and the change of having a manual, motorized or automatic control, possibly associated with a photoelectric cell, so that the tilting of the louver boards can be put at the best as a function of the outside weather conditions.

According to this invention, a shutter provided with tiltable louver boards comprises modular elements fitted in a frame made of standard sections, said modular elements comprising a pair of parallel racks with which a plurality of pinions or gears is engaged which are fastened to a corresponding number of head supports of the louver boards of the shutter, each of said rack modular elements being provided with a longitudinal slot which extends for a large portion of the same module length and is intended for allowing the transverse sliding connection between the racks and the passage of a rod controlling the louver boards which is keyed on one of said pinions, whereby a self-locking is made which can be mounted at any spot along the sides of the shutter.

Said modular rack-elements are provided at their ends with male and female junctions whereby two or more rack elements can be restraint-jointed in prosecution as far as the desired length is obtained.

This invention will be now described with reference to the annexed drawings which show as an illustration and not as a limitation a preferred embodiment thereof.

In the drawings:

Fig.1 shows an exploded view of the shutter according to this invention;

Fig.2 shows a cross section along to a horizontal plane on which the tilting axis of a louver board lies;

Fig.3 shows a cross section of an upright side-strut of the shutter wherein the louver boards are set in closed positions;

Fig.4 shows a view similar to Fig. 3 the louver boards being set at the utmost opening;

Fig.5 shows a vertical cross section in enlarged

scale wherein the transverse sliding connection is shown between the two racks;

Fig. 6 shows a view similar to Fig. 5 wherein the crank control is shown for tilting the louver boards.

With reference to Fig. 1 the shutters according to this invention comprises a perimetrical frame made of metal or other suitable material such as for instance a metal standard section made of two cross members 1 respectively located at the base and at the top and of two upright side-struts 2.

Elements 1 and 2 are provided with usual cuts 3 at 45 degrees at the corners and are connected to one another by means of miter squares 4 cooperating with screws 5 and bores 6 which are provided through the same cross members.

The two cross members 1 are provided with slot-seats 7 into which the base of a ledge 8, 8' is retained at its ends by terminal blocks 9 housed in upright sides 2 of the frame. In ledges 8, 8' are fitted gaskets 10 by which a perfect seal is ensured against light and weather agents whenever the adjacent louvers of the shutter are in a closure attitude. For the same purpose an analogous gasket 10 is inserted along one of the edges of the louver boards 11 which in Fig. 1 are shown as tubular elements made of tubular metal thin sheet or plastic material or other suitable material.

At the inside of upright sides 2 (see also figures 2-5) are inserted racks 12 which are formed by two modular elements of which one carries at its upper end a toothed projection 13 and at its lower end a recess 14 while the other carries at its upper end a recess 14 and at its lower end a toothed projection 13 which projections and recesses allow to obtain rapidly and without any tool the required height of the shutter.

As better shown in fig. 5 each modular element 12 of a rack is provided with a large slot 15 which extends substantially for all the length of the modular element 12. In order to keep connected with one another the two racks and at the same time to allow the same sliding with reciprocating motion, some supporting plates 16 are provided at intervals which have a circular bore 17 and four chamfered stakes 18, located at the corners of said plates, which stakes, being inserted through slots 15, allow to keep said racks at their positions with the rack teeth 19 facing each other. Between the teeth of the respective racks, pinions 20 are inserted which are engaged with the rack teeth and are disposed at intervals equal to the distances between the axes of two subsequent louver boards.

In the case of fig. 5 there are three pinions 20 of which one is inserted into bore 17 of guiding-support plate 16.

Each pinion 20 is provided at its center with a "thousand grooves" bore in which a corresponding hub 22 is inserted which is carried by the head-support 23 on which a louver board 11 is fitted.

Head support 23 at the portion thereof adjoining

upright side 2 has a bent edge 24 (fig. 4). Between head support 23 and hub 22 a flexible strip 25 is inserted which penetrates between the longitudinal edges 26 of standard section upright side 2 and which is pushed towards the head-support 23 by means of a spring 27 made of inox steel coaxial with pinion 20. Whenever the louver board is in opened position (Fig. 4) the bent edge 24 of bent edge 24 of support 23 urges spring 27 to compress whereby flexible strip 25 is urged between the edges 26 of standard section upright side 2.

In a position of total closure (fig. 2 and 3) spring 27 urges flexible strip 25 against the head-support 23 thereby ensuring the perfect seal against light and weather agents coming from above. In case of an horizontal origin of said light and agents, said seal is ensured by the above gaskets 10 which are arranged along the edge of each louver board 11.

As previously mentioned, all the assembly of racks 12 and of the components thereto associated is readily mounted by fitting it in upright side 2. The stop stake 28 carried by hub 22 and projecting through a corresponding hole provided in the standard section upright side 2 serves for blocking all the assembly at its position and for preventing any accidental slidings.

In fig. 6 the rotation control of the louver boards is illustrated. It consists of a box 30 which is fitted through slot 15 of rack 12 and comprises a circular housing 31 similar to the one carried by guiding support plates 16 (fig. 5) in which one of the pinions 20 is fitted. Still in box 30 a housing 36 is provided for a worm screw 32 engaged with pinion 20 and secured to a metal axle 33 with exagonal cross section of which an end is fitted into a ferrule 34 while the other end is secured to a crank 35 which is carried by plate 37 fastened to box 30 by means of a pair of screws or other similar means.

Obviously, by turning the crank in the two directions, the corresponding rotation of pinions 20 and of louver boards 11 is caused, whereby said boards can make a rotation through an angle of about 180 degrees which, from a position of total closure, ranges to a horizontal position (maximum opening) by passing through the various intermediate positions which can be inclined either upwards and downwards. Said rotation movement of the louver boards is impressed by the couple worm screw and pinion which being a transmission of irreversible type contributes to the louver boards the appreciable characteristic of being self-locking and consequently burglar-proof when they are made with material of suitable resistance.

It is to be emphasized also the fact that the rotation of louver boards can be controlled from any spot along the upright side-strut and that said control is totally contained within said side-strut differently from what occurs in the shutters of the present trade.

For the sake of simplicity a crank control has

been represented and described but it should be understood that a motorized control can also be provided which could be possibly automatized by a fotoelectric cell device which could be actuated by outside light.

The present invention has been illustrated and described with reference to a preferred embodiment thereof but it should be understood that structural variants thereof could be contributed thereto without departing from the protecting scope of the claims.

#### Claims

1. A shutter with tiltable louver boards (11), comprising in combination a support frame comprising standard sections and made of two horizontal cross members (1) and two upright side struts (2) and a modular assembly for supporting and rotating said louver boards fitted into said side struts and provided with a control system which can be fitted at any spot along said side struts, characterized by the fact that said modular assembly comprises a series of elements of which each comprises a pair of parallel racks (12) vertically set, which engage a plurality of pinions (20) which are secured to a corresponding number of head-supports (23) of the shutter louver boards, each of said rack modular elements being provided with a longitudinal slot (15) which extends for a long portion of the same module and is intended for providing the transverse sliding connection between the two racks and the passage of a control axle (33) for controlling the louver boards tilt, which axle is keyed on a worm screw (32) which acts on one of said pinions (20) so that a self-locking control is formed of the louver board tilt; said worm screw (32), the related control axle (33) and the operating crank (35) being carried by a readily adaptable box which is inserted through one of the slots provided along the rack modular elements on condition that the worm screw engages one of the pinions of the shutter louver boards.
2. A shutter according to claim 1, characterized by the fact that said rack modular elements (12) are provided at their ends with groove-and-tongue joints (14,13) which allow to dispose in continuation a number of modules corresponding to the upright extension of the shutter.
3. A shutter according to claims 1 and 2, characterized by the fact that said control axle (33) of the worm screw (32) can be located at any spot along one of the side struts (2) of said support frame perpendicular to the tilting axis of the louver boards.

4. A shutter according to claims 1-3 characterized by the fact that said head-support (23) of each louver board (11) has an edge (24) which is bent towards the related upright side-strut (2) and that between each pinion (20) and said edge (24) of each head-support a flexible continuous grooved strip (25) is interposed which is elastically urged by an helical spring (27), coaxial with said pinion, into said bent edge (24) when the louver boards (11) are set in position of closure so that the possible clearances between the moving parts are recovered and a good seal in the vertical direction is ensured against light and weather agents.
5. A shutter according to claims 1-4 characterized by the fact that the seal in horizontal direction is ensured by a gasket (10) disposed along one of the longitudinal edges of each louver board (11).
6. A shutter according to claims 1-5 characterized by the fact that in order to transversely connect and guide the sliding of the racks (12) quadrangular plate supports (16) are provided having a circular center housing (17) for one of said pinions (20) and having at their corners four chamfered stakes (18) which are perpendicular to the plate plan and pass through slots (15) provided along said rack modular elements (12).
7. A shutter according to claims 1-6 characterized by the fact that the number of the pinions (20) is equal to the number of the louver boards and the space between each couple of pinions is equal to the distance between each couple of blades.
8. A shutter according to claims 1-7, characterized by the fact that the cross members (1) of the window frame are provided with a ledge (8) for the base louver board and with a second ledge (8') for the top louver board, also said ledges being provided with sealing gaskets (10) similar to those carried by the louver boards.

#### Patentansprüche

1. Ein Rolladen mit kippbaren Leisten (11), der in Kombination folgendes aufweist: einen Tragrahmen, der Standardprofile aufweist und aus zwei horizontalen Querträgern (1) und zwei senkrechten seitlichen Streben (2) besteht, sowie eine Modulbaugruppe zur Abstützung und zum Drehen der Rolladen-Leisten, die in die seitlichen Streben eingesetzt sind, und mit einem Stellsystem, das an jedem Punkt längs der seitlichen Streben anbringbar ist, dadurch gekennzeichnet, daß die Modulbaugruppe eine Reihe von Elementen aufweist, von denen jedes ein Paar von vertikal an-

- geordneten parallel n Zahnstangen (12) aufweist, die mit einer Vielzahl von Ritzeln (20) in Eingriff sind, die an einer entsprechenden Zahl von Kopfabstützungen (23) der Rolladen-Leisten befestigt sind, wobei jedes der modularen Zahnstangenelemente mit einem Längsschlitz (15) versehen ist, der sich über einen langen Bereich des gleichen Moduls erstreckt und dazu dient, die Quergleitverbindung zwischen den beiden Zahnstangen und den Durchtritt einer Stellachse (33) zum Einstellen der Neigung der Rolladen-Leisten zu ermöglichen, wobei diese Achse auf eine Schnecke (32) gekeilt ist, die auf eines der Ritzel (20) wirkt, so daß die Rolladen-Leistenneigung selbsthemmend einstellbar ist; wobei die Schnecke (32), die zugehörige Stellachse (33) und die Betätigungskurbel (35) an einem leicht adaptierbaren Kasten getragen sind, der durch einen der Schlitze, die entlang den modularen Zahnstangenelementen vorgesehen sind, einsetzbar ist mit der Maßgabe, daß die Schnecke mit einem der Ritzel der Rolladen-Leisten in Eingriff gelangt.
2. Rolladen nach Anspruch 1, dadurch gekennzeichnet, daß die modularen Zahnstangenelemente (12) an ihren Enden mit Nut-und-Federverbindungen (14, 13) versehen sind, die das fortlaufende Anordnen einer Reihe von Modulen entsprechend der vertikalen Ausdehnung des Rolladens erlauben.
3. Rolladen nach den Ansprüchen 1 und 2, dadurch gekennzeichnet, daß die Stellachse (33) der Schnecke (32) an jedem Punkt entlang einer der seitlichen Streben (2) des Tragrahmens senkrecht zu der Kippachse der Rolladen-Leisten positioniert sein kann.
4. Rolladen nach den Ansprüchen 1-3, dadurch gekennzeichnet, daß die Kopfabstützung (23) jeder Rolladen-Leiste (11) einen Rand (24) hat, der in Richtung zu der zugehörigen senkrechten seitlichen Strebe (2) gebogen ist, und daß zwischen jedem Ritzel (20) und jedem Rand (24) jeder Kopfabstützung ein flexibler, fortlaufender, mit einer Vertiefung versehener Streifen (25) angeordnet ist, der von einer mit dem Ritzel coaxialen Schraubenfeder (27) elastisch in den umgebogenen Rand (24) gedrängt wird, wenn die Rolladen-Leisten (11) in die Schließposition gestellt sind, so daß die etwaigen Spielräume zwischen den bewegten Teilen rückgewonnen werden und eine gute Abdichtung in Vertikalrichtung gegenüber Licht und Wiedereinflüssen gewährleistet ist.
5. Rolladen nach den Ansprüchen 1-4, dadurch gekennzeichnet, daß die Abdichtung in Horizontal-
- richtung durch ein Dichtungselement (10) gewährleistet ist, das entlang einem der Längsränder jeder Rolladen-Leiste (11) angeordnet ist.
6. Rolladen nach den Ansprüchen 1-5, dadurch gekennzeichnet, daß zum Querverbinden und zum Führen der Gleitbewegung der Zahnstangen (12) viereckige Plattenabstützungen (16) vorgesehen sind, die ein kreisrundes zentrales Gehäuse (17) für eines der Ritzel (20) und an ihren Ecken vier abgerundete Pflöcke (18) haben, die zu der Plattenebene senkrecht sind und durch Schlitze (15) gehen, die entlang den modularen Zahnstangenelementen (12) vorgesehen sind.
7. Rolladen nach den Ansprüchen 1-6, dadurch gekennzeichnet, daß die Zahl der Ritzel (20) gleich der Zahl von Rolladen-Leisten ist und daß der Abstand zwischen jedem Ritzelpaar gleich dem Abstand zwischen jedem Paar von Leisten ist.
8. Rolladen nach den Ansprüchen 1-7, dadurch gekennzeichnet, daß die Querträger (1) des Fensterrahmens mit einer Querleiste (8) für die unterste Rolladen-Leiste und mit einer zweiten Querleiste (8') für die oberste Rolladen-Leiste versehen sind, wobei auch diese Querleisten mit Abdichtelementen (10) gleich denjenigen, die von den Rolladen-Leisten getragen werden, versehen sind.

#### Revendications

1. Volet avec lames de persiennes inclinable (11), comprenant en combinaison un châssis de support comprenant sections standard et constitué par deux traverses horizontaux (1) et deux montants latéraux verticaux (2) et un complexe modulaire pour soutenir et faire tourner les dites lames de persienne monté dans les dits montants latéraux et pourvu d'un système de commande qui peut être monté en un point quelconque le long des dits montants latéraux, caractérisé en ce que le dit complexe modulaire comprend une paire de crémaillères parallèles (12) montées verticalement, qui engagent une pluralité de pignons (20) qui sont assurés à un nombre correspondant de supports de tête (23) des lames de persienne du volet, chacun des dits éléments modulaires de crémaillère étant pourvu d'une rainure longitudinale (15) qui s'étend le long d'une longue partie du même module et qui est destinée à fournir la connexion coulissante transversale entre les deux crémaillères et le passage d'un axe de commande (33) pour commander l'inclinaison des lames de persienne, lequel axe est joint à clavette à une vis sans fin (32) laquelle agit sur une

- d s dits pignons (20) d sorte qu'un commande à blocage automatique soit formé pour l'indinaison des lames de persienne; dît vis sans fin (32), son axe de commande (33) et la manivelle d'actionnement, (35) étant portés par une boîte facilement adaptable laquelle est insérée à travers une des rainures fournies le long des éléments modulaires de crémaillère, à condition que la vis sans fin engage un des pignons des lames de persienne du volet.
2. Volet selon la revendication 1, caractérisé en ce que les dits éléments modulaires de crémaillère (12) sont pourvus à leur extrémités de joints rainure-et-clavette (14, 13) qui permettent de disposer en continuation un nombre de modules correspondant à l'étendue verticale du volet.
3. Volet selon les revendications 1 et 2, caractérisé en ce que le dît axe de commande (33) de la vis sans fin (32) peut être disposé en un point quelconque le long que l'un des montants latéraux (2) du dît châssis de support perpendiculaire à l'axe d'inclinaison des lames de persienne.
4. Volet selon les revendications 1 à 3, caractérisé en ce que le dît support de tête (23) de chaque lame de persienne (11) a un bord (24) qui est plié vers le montant latéral vertical (2) relatif et que entre chaque pignon (20) et le dît bord (24) de chaque tête de support on a inséré une bande rainée continue flexible (25) qui est pressée élastiquement par un ressort hélicoïdal (27), coaxial avec le dît pignon, en dît bord plié (24) lorsque les lames de persienne (11) sont mises en position de fermeture, de sorte que les éventuels jeux entre les parts en mouvement soient récupérés et une bonne étanchéité sont assurée contre la lumière e les agents atmosphériques.
5. Volet selon les revendications 1 à 4, caractérisé en ce que l'étanchéité en direction horizontale est assurée par une garniture (12) disposée le long de l'un des bords longitudinaux de chaque lame de persienne (11).
6. Volet selon les revendications 1 à 5, caractérisé en ce que à fin de joindre et conduire transversalement le coulisement des montants (12) il est pourvu de supports à plaque quadrangulaire (16) qui ont un logement central circulaire (17) pour l'un des dits pignons (20) et qui ont à leur coins quatre étais chanfreinés (18) qui sont perpendiculaires au plan de la plaque et passent à travers des rainures (15) fournies le long des dits éléments modulaires de crémaillère (12).
7. Volet selon les revendications 1 à 6, caractérisé
- en ce que le nombre d pignons (20) st égal au nombre de lames de persienne e l'espace entre chaque paire de pignons st égal à la distance entre chaque paire de lames.
8. Volet selon les revendications 1 à 7, caractérisé en ce que les traverses (1) du châssis de fenêtre sont pourvues d'une feuillure (8) pour la lame de persienne de base et d'une seconde feuillure (8') pour la lame de persienne supérieure, les dites feuillures étant en outre pourvues de garnitures d'étanchéité (10) semblable à celles portées par le lames de persienne.

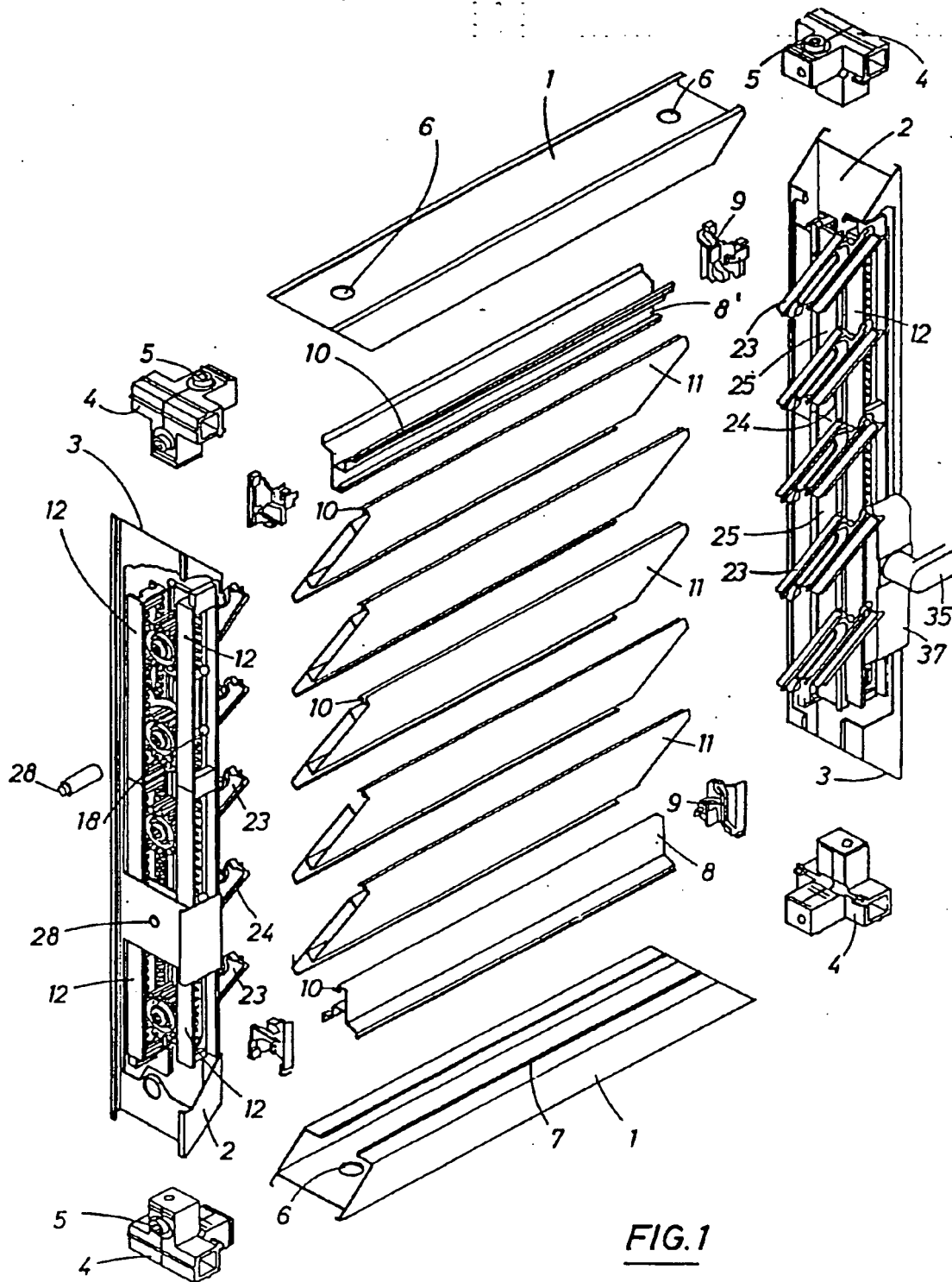


FIG. 1

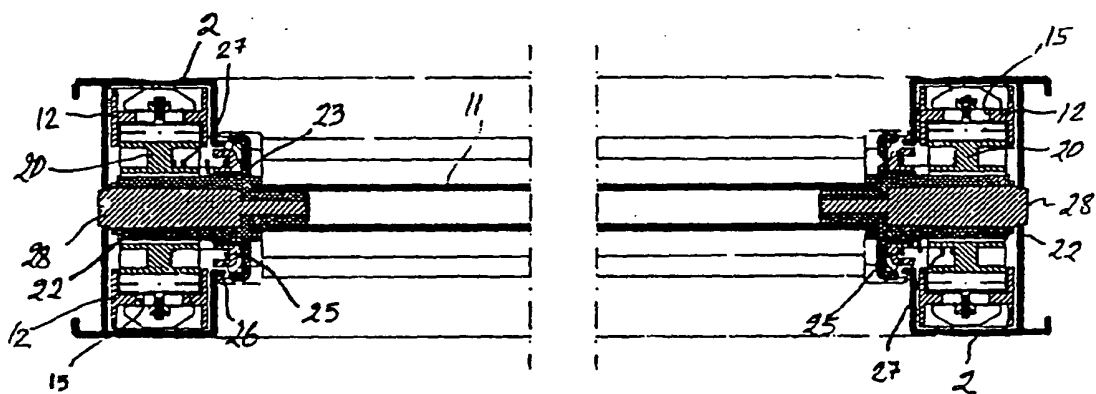


FIG. 2

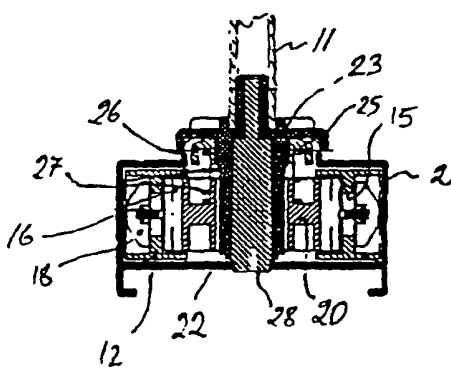


FIG. 3

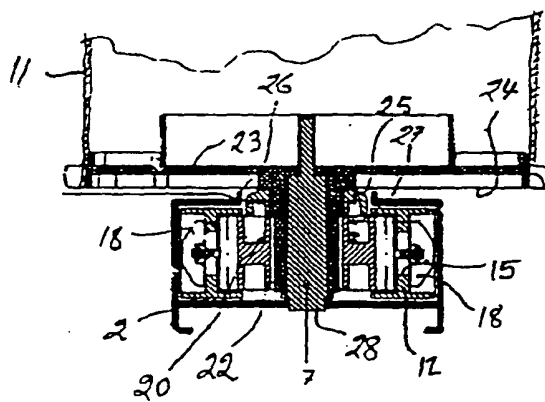


FIG. 4



